

IN THE CLAIMS:

Please amend the claims below, as follows:

1. (Currently Amended) A method of substantially continuously optimising
a stochastic parameter \mathcal{g} that characterizes the instantaneously prevailing
readiness with which crop is processed in a harvesting machine, including the
step of recursively calculating the optimized parameter value in accordance
with the following algorithm:

$$\hat{\mathcal{g}}(t) = f(\hat{\mathcal{g}}(t-1), \varepsilon(t, \hat{\mathcal{g}}(t-1))) \quad - (A)$$

wherein:

$\hat{\mathcal{g}}(t)$ is the optimized stochastic parameter value at time t ; and

$\varepsilon(t, \hat{\mathcal{g}}(t))$ is an error prediction function.

2. (Currently Amended) A method according to claim 1, ~~characterised~~
wherein ~~that~~ the algorithm (A) has the form:

$$\hat{\mathcal{g}}(t) = f(\hat{\mathcal{g}}(t-1), \dots, \hat{\mathcal{g}}(t-n_g), \varepsilon(t), \dots, \varepsilon(t-n_e), t)$$

3. (Currently Amended) A method according to Claim 1 ~~or 2~~, ~~characterised~~
wherein ~~that~~ the algorithm (A) has the form:

$$\hat{\mathcal{g}}(t) = \hat{\mathcal{g}}(t-1) + \gamma(t)r^{-1}(t)\psi(t, \hat{\mathcal{g}}(t-1))\varepsilon(t, \hat{\mathcal{g}}(t-1))$$

wherein:

$\gamma(t)$ is a gain term;

$r(t)$ is a scalar approximation of a Hessian $V''(\vartheta)$ in which V is a quadratic error criterion;

$\psi(t, \vartheta) = \frac{d\hat{y}(t, \vartheta)}{d\vartheta}$, in which $\hat{y}(t, \vartheta)$ is an estimation of a value indicative of the effectiveness of crop processing in said harvesting machine, said estimation being based on stochastic parameter ϑ ; and

$\varepsilon(t, \hat{\vartheta}(t-1))$ is the difference between the actual effectiveness value $y(t)$ and the estimated value $\hat{y}(t, \hat{\vartheta})$ based on the previously optimized parameter $\hat{\vartheta}(t-1)$.

4. (Currently Amended) A method according to Claim 3, ~~characterised~~ wherein that the algorithm (A) includes an estimation of $r(t)$ that is weighted to reduce the influence, on the optimized parameter values $\hat{\vartheta}$, of past measurements.

5. (Currently Amended) A method according to Claim 3 ~~or 4~~, ~~characterised~~ wherein that:

said stochastic parameter ϑ is usable in a model for the relation between a value $u(t)$ indicative of the feedrate of crop into the harvesting machine and a value $y(t)$ indicative of the effectiveness of an operation processing said crop in said harvesting machine; and

said value $\hat{y}(t, \vartheta)$ is an estimation value of the effectiveness obtained by the application of said model to the feedrate values $u(t)$.

1 6. (Currently Amended) A method according to Claim 5, ~~characterised~~
2 ~~wherein that~~ said model comprises an exponential function.

1 7. (Currently Amended) A method according to Claim 6, ~~characterised~~
2 ~~wherein that~~ said model has the form:

3
$$\hat{y}(t, \theta) = \exp(\theta u(t)) - 1. \quad - (B)$$

1 8. (Currently Amended) A method according to ~~any of the Claims 5 to 7,~~
2 ~~characterised wherein that:~~

3 said crop processing comprises separating useable crop parts from other
4 plant matter; and

5 said value $y(t)$ is indicative of a flow of useable crop losses in a selected
6 part ~~(13/14)~~ of the harvesting machine.

1 9. (Currently Amended) A method according to ~~any of the Claims 5 to 7,~~
2 ~~wherein characterised in that:~~

3 said crop processing operation comprises separating useable crop parts
4 from other plant matter; and

5 said value $y(t)$ is indicative of a flow of return crop in a selected part ~~(15)~~
6 of the harvesting machine.

1 10. (Currently Amended) A method of operating a harvesting machine
2 comprising the steps of:

3 ~~(i)~~ substantially continuously optimizing a stochastic parameter θ
4 that characterizes the instantaneously prevailing readiness with which
5 the harvesting machine processes crop; and

6 ~~(ii)~~ substantially continuously adjusting a performance variable of the
7 harvesting machine in dependence on the instantaneous, optimized value $\hat{\theta}$ of
8 ~~the~~ said parameter in order to optimize the load of the harvesting machine so
9 as to keep a value $y(t)$ indicative of the effectiveness of said harvesting machine
10 below a predetermined value.

1 11. (Currently Amended) A method according to Claim 10, characterised
2 wherein ~~in that~~:

3 processing the crop comprises separating useable crop parts from other
4 plant matter;

5 optimizing the load of the harvesting machine comprises optimizing the
6 feedrate $u(t)$ of crop into the harvesting machine; and

7 the effectiveness value comprises losses $y(t)$ of useable crop parts.

1 12. (Currently Amended) A method according to Claim 10 ~~or 11~~,
2 ~~characterised wherein~~ in that the step (i) of continuously optimizing a stochastic
3 parameter θ includes carrying out the method steps of any of the Claims 1 to 9.

1 13. (Currently Amended) A method according to ~~any of the Claims 10 to 12~~,
2 ~~characterised wherein~~ in that the step (ii) of adjusting a performance variable of
3 the harvesting machine occurs in dependence on the output of an inverted form

4 of a yield loss estimation function:

$$5 \quad \hat{y}(t, \vartheta) = \exp(\vartheta u(t)) - 1 \quad - (B)$$

1 14. (Currently Amended) A method according to ~~to any of the Claims 10 to~~
 2 ~~13, characterised wherein in that~~ adjusting a performance variable comprises
 3 adjusting the travel speed of said harvesting machine or the actual cutting width
 4 of a header of said harvesting machine.

1 15. (Currently Amended) A method of mapping one or more field lots for
 2 variations in a stochastic parameter ϑ that characterizes the instantaneously
 3 prevailing readiness with which crop is processed in a harvesting machine, the
 4 method comprising the steps of:

5 ~~(i) operating a harvesting machine to harvest crop in a said field lot;~~

6 ~~(ii) simultaneously measuring the machine load and the machine~~

7 ~~effectiveness and determining the position of the machine in the field lot;~~

8 ~~(iii) storing data indicative of the position of the harvesting machine at~~
 9 time t ;

10 ~~(iv) using the measured machine load data $u(t)$, and machine~~

11 ~~effectiveness data $y(t)$ in an optimization of the said parameter ϑ ; and~~

12 ~~(v) mapping the optimized parameter values $\hat{\vartheta}$ obtained from the step~~

13 ~~of using the measured machine load data $u(t)$ and machine effectiveness data~~

14 ~~$y(t)$ in an optimization of said parameter ϑ ; (iv) so as to produce a parameter~~

15 map of the field lot.

1 16. (Currently Amended) A method according to Claim 15, ~~characterised~~
2 ~~wherein in that~~ the step of using the measured machine load data $u(t)$ and
3 ~~machine effectiveness data $y(t)$ in an optimization of said parameter ϑ (iv)~~
4 includes carrying out an optimization according to ~~any of the Claims 1 to 9.~~

1 17. (Currently Amended) A method of operating a harvesting machine
2 comprising the steps of:

3 (i) ~~substantially continuously optimizing~~ a stochastic parameter ϑ that
4 characterizes the instantaneously prevailing readiness with which the
5 harvesting machine separates useable crop parts from other plant matter; and
6 (ii) ~~sending~~ a display signal, that is indicative of the instantaneous
7 parameter value $\hat{\vartheta}$, to a display device.

1 18. (Currently Amended) A method according to Claim 17, ~~characterised~~
2 ~~wherein in that~~ the step (i) of ~~optimizing~~ a stochastic parameter ϑ includes
3 carrying out the method of ~~any of the Claims 1 to 9.~~

1 19. (Currently Amended) A method according to Claim 17 ~~or 18,~~
2 ~~characterised wherein in that~~ the display signal indicates an abnormal parameter
3 value $\hat{\vartheta}$.

1 20. (Currently Amended) ~~A method~~ Methods according to Claim 1 ~~any of the~~
2 ~~preceding claims, characterised wherein in that~~ said harvesting machine is a
3 combine harvester and the crop is a grain-bearing plant.

1 | 21. (Currently Amended) ~~A method~~ Methods according to Claim 8 ~~or 9 or to any~~
2 | ~~other Claim referring thereto, characterised wherein that the said selected part~~
3 | ~~of the harvesting machine is selected from:~~
4 | the straw walkers ~~(13)~~;
5 | the rotary separator;
6 | the sieves ~~(14)~~;
7 | the grain elevator;
8 | the return flow system ~~(15)~~;
9 | the cleaning section; or
10 | the axial threshing and separating rotor;
11 | of a combine harvester.